

Chemical Process Hazard Analysis Moderate Hazard Review Checklist

(See attached instructions)



Introduction

Every laboratory performing chemical processes should have a current hazard analysis. The Process Hazard Analysis (PHA) is mandatory for chemical processing laboratories that fall under 29 CFR 1910.1450 to assess the hazards associated with new or modified chemical processes or operations. The Moderate Hazard Review Checklist is used in evaluating the safety of **new, modified, or relocated experiments or tests which present a moderate potential hazard to employees, equipment and facilities, or the environment.** Supervisor's Designees or employees performing the operation are responsible for completing the analysis. Participation by a representative of the Occupational Safety and Health Division (Code 350) is recommended.

Instructions at the end of this template provide information on the hazard review process, and aid the in determining which level of Process Hazard Review is appropriate: Low, Moderate, or High. The Moderate Hazard Review Checklist is used for those processes or experiments that present a moderate potential hazard, but do not require a full High Hazard Review (HHR).

This is a multi-page checklist that requires Supervisor's Designees and workers to work together to ensure that all potential problem areas are analyzed, documentation is generated where necessary, and personnel are made aware of the hazards and safety review findings that affect their work. This checklist, when complete, becomes part of a safety documentation package. This package should be available in a prominent location in the laboratory or the electronic location posted while the work is in progress.

Laboratory Name/Description:

Laboratory Location:

Supervisor's Designee:

Code:

Extension:

Product/Experiment Description:

Brief Description of Process:

To check a checkbox, double-click on the box, and select Checked or Not Checked.

A. Have the following been defined by appropriate documentation? Check if done.

Done N/A 1. Process description

Done N/A 2. Process flow diagram/equipment, not always applicable

Done N/A 3. Material Safety Data Sheets (MSDS) (list of chemicals and MSDS on-line)

Done N/A 4. Laboratory Safety Procedures, including (as applicable)

Done N/A a. Emergency Procedures (This can be part of the Building Emergency Plan.)

• Shut-down

• Spills

Done	N/A	4b. Specialized Operating Procedures:
		• Normal Start-Up
		• Normal Operation
		• Normal Shutdown
Done	N/A	c. Lockout Procedure, if applicable
Done	N/A	d. Operating Hazards (including chemical, mechanical, etc.)
Done	N/A	e. Chemical Line Break Procedure
Done	N/A	f. Personal Protective Equipment
Done	N/A	g. Procedure for Modifications
Done	N/A	h. Waste Disposal Procedures
<i>ATTACH all of the above documentation to this checklist or a list of electronic locations</i>		
B. Evaluate and describe the following potential hazards, and the necessary precautions taken for each. Attach supplemental sheets as necessary. Check when completed. Write "N/A" if not applicable.		
1. Toxicity of solids, liquids, and gases associated with the process (Consult MSDS)		
2. Reactivity and explosion hazards of solids, liquids, and gases associated with the experiment or process (Consult MSDS)		
3. Corrosiveness of solids, liquids, and gases associated with the process (Consult MSDS)		
4. Ignition sources such as sparking motors, switches, alarms, exposed heaters, etc.		
5. Fuel sources such as feedstock, products, solvents, gaseous reaction products, insulation, etc., in the area that could be ignited (Consult MSDS)		
6. Sound level exposure		
7. Nuclear radiation		
8. Radiations such as ultraviolet, infrared, microwaves, lasers, X-rays, etc.		
9. Pressure system failure (projectiles, shrapnel, sprays from leaks, etc.)		
10. Electrical (e.g., bonding, grounding, sources identified/labeled)		
11. Pressure and temperature transients		
12. Ergonomics (spacing, access to equipment, physical requirements of job)		
13. Other (describe)		
C. Consider and evaluate the effect of your work in the following environmental areas. Attach supplemental sheets as necessary. Check when completed.		
1. Identification and resolution of potential air, water and soil pollution		

2. Identification and development of written disposal methods for all wastes in accordance with GPR 8500.3 and coordinated with MEMD		
3. Air emissions and air emission rates calculated and reported to the MEMD		
D. Confirm that the following have been provided in the design and construction of the equipment/apparatus, if applicable. Check left column if OK.		
1. Piping and Instrumentation		
a. Pressure relief valves and/or rupture disks where necessary (vessels, positive displacement pumps, blocked-in lines, blocked-in heat exchangers, compressors, etc.) with no valves or restrictions of any kind in the lines between the equipment and the protective devices		
(1) Properly sized	Yes	N/A
(2) Proper set pressure	Yes	N/A
b. Proper relief and blow-down system with no valves or restrictions of any kind in the lines between the protective devices and the point of discharge		
c. Emergency overflow lines	Yes	N/A
d. Emergency shutdown system	Yes	N/A
e. Suitable alarms, shutdowns, interlocks, purges, etc., to bring unit to a safe automatic shutdown in the event of an emergency such as:		
(1) Loss of instrument air	Yes	N/A
(2) Loss of steam	Yes	N/A
(3) Loss of cooling water	Yes	N/A
(4) Loss of electric power	Yes	N/A
(5) Loss of fuel	Yes	N/A
(6) Severe leakage by rupture of piping or equipment, by leakage from stuffing boxes or mechanical seals, or due to corrosion	Yes	N/A
(7) Fire in the area of the unit	Yes	N/A
(8) Other (Explain if Yes)	Yes	N/A
f. Alarms for all other critical variables (high/low temperature, high/low pressure, high/low flow, high/low level, etc.)		
g. Automatic shutdown of certain pieces of equipment if certain critical variables are exceeded (high/low temperature, high/low pressure, high/low flow, high/low level, etc.)		
h. Fail-safe positioning of control valves and solenoid valves in the event of instrument air loss or electrical failure		
i. Pressure, temperature, flow, and level measurement devices installed at all critical points		
j. Suitable devices to prevent the flow or backup of materials into undesirable areas		
k. Suitable interconnect methods to utility systems such as water, gas, electricity, etc. (e.g., use of Back Flow Preventer Valve in a potable water system)		
l. Backup pumps, compressors, etc., where required for safety		
m. Automatic detection devices, as applicable, for:		
(1) Toxic materials	Yes	N/A
(2) Combustible mixtures	Yes	N/A
(3) Radiation	Yes	N/A
(4) Oxygen detection	Yes	N/A
(5) Fire	Yes	N/A
If Yes for any of above, describe:		

2. Pressure vessels, pumps, compressors, heat exchangers, etc.		
a. Proper materials of construction with consideration for corrosion, fatigue, stress cracking, embrittlement, strength, toughness, etc. Special care should be taken when using glass.		
b. Proper design and material for seals and gaskets		
c. Proper design pressures and temperatures		
d. Guards on all rotating, reciprocating, and conveying equipment		
e. PVS certified by RECERT		
3. Vessel identification, tagging, and record keeping in accordance with Center's procedures? If not, explain.		
OK		
1. What <i>Chemicals</i> are used in your process?		
2. Are any of the Chemicals: (check all that apply)		
Carcinogen	Developmental Toxin	
Flammable	Light Sensitive	
Mutagen	Peroxidizable	
Pyrophoric	Radioisotope	
Reactive With Air	Reproductive Toxin	
Shock Sensitive	Temperature Sensitive	
Toxic/Poison		
3. If your Chemicals display any of the above listed characteristics, are they used in a chemical exhaust hood certified by IH and is the ductwork certified as leakproof?		
	Yes	N/A
4. If your Chemicals display any of the above listed characteristics, will access to the roof be prohibited while you are running your experiment or equipment?		
	Yes	N/A
5. How will these Chemicals be stored?		
6. If refrigeration is required, is the refrigerator or freezer alarmed, approved, and properly marked for chemical storage?⁶		
	Yes	N/A
F. Transportation and Storage. (Check left column if OK)		
OK		
1. Will you transport the chemicals on-site?	Yes	N/A
How will you transport chemicals in the building or across the site?		
2. Will chemicals be shipped off site?	Yes	N/A
If Yes, do you have the necessary information for the 20-4 Shipping Request?	Yes	N/A
G. Area: Evaluate the following safety items and describe the reason or location for each. (Check left column if OK)		
OK		
1. Are there limits on personnel in attendance while operating?	Yes	N/A
2. Are there special area requirements, e.g., High Noise?	Yes	N/A
3. Are barricades required?	Yes	N/A
4. Are special signs or alarms needed?	Yes	N/A

5. Are exits from laboratory or area adequate (standard and emergency)?			
6. Where are the nearest fire and/or evacuation alarms?			
7. Where are the nearest fire extinguishers?			
8. Have extinguishers been inspected within a year? When?			
9. Where is the nearest Safety Shower and/or Eye Wash?			
10. Has the eyewash been inspected weekly?			
11. What is the location of the nearest telephone?			
12. Will there be any unattended operation of this process? If so, what special procedures will be implemented?			Yes N/A
13. Will this process be operated by a lone worker? If yes, explain why it is safe.			Yes N/A
14. Will this process be operated after normal working hours? If yes, what special procedures will be implemented?			Yes N/A
15. Are the Emergency Contact names and phone numbers posted on the door?			
H. Training: describe or attach list of any special training required, and identify for whom.			
I. Are there any corrections that must be made before startup?			
<i>At this time, print this document and obtain the appropriate signatures. The following are required:</i>			
Certification and Approval			
Certification by the Supervisor's Designee that all required corrections have been completed, the laboratory process is safe (subject to completion of required training), and procedures are properly implemented and understood.			
Supervisor's Designee Signature	Supervisor's Designee Printed Name	Code	Date
Certification by laboratory personnel that they have read and understood this Hazard Review and associated laboratory procedures: (use additional sheets if necessary)			
Supervisor's Designee Signature	Supervisor's Designee Printed Name	Code	Date
Laboratory User Signature	Laboratory User Printed Name	Code	Date
Laboratory User Signature	Laboratory User Printed Name	Code	Date
Laboratory User Signature	Laboratory User Printed Name	Code	Date

Certification and Approval
(Continued from page 6)

Laboratory User Signature	Laboratory User Printed Name	Code	Date
Laboratory User Signature	Laboratory User Printed Name	Code	Date
Laboratory User Signature	Laboratory User Printed Name	Code	Date
Branch Head Approval:			
Branch Head Signature	Branch Head Printed Name	Code	Date
Concurrence by Code 205.2, if they participate in the review:			
205.2 Concurrence Signature	205.2 Concurrence Printed Name	Code	Date

Following all approvals, a copy of this document and its attachments, including a copy of the Hazard Analysis Selection Matrix, shall be posted in the laboratory area or electronically and the electronic location posted; and placed under configuration control per GPG 1410.2. A dated copy shall be sent to Code 205.2.

General Instructions for Laboratory Process Hazard Analysis

Introduction

The identification and control of hazards in the laboratory is the responsibility of the owning organization. The Laboratory Process Hazard Analysis is designed to aid management in meeting this responsibility.

The Process Hazard Analysis (PHA) is mandatory for laboratories and other areas that use chemicals falling under 29 CFR 1910.1450 requirements. These analyses are used to assess the hazards associated with new or modified processes or operations in a laboratory environment. There are three levels of reviews for three anticipated levels of hazards: Low, Moderate, and High.

The Hazard Analysis Selection Matrix provides the Supervisor's Designee a quick way to assess the level of process hazard analysis required. The matrix has three vertical columns that correspond to the three levels of review. Horizontal lines describe various potential hazards. By checking those that apply in the appropriate columns, the necessary review level becomes easier to define.

Approach

The first step in determining the level of review required is to fill out the **HAZARD ANALYSIS SELECTION MATRIX** on the last page of these instructions. There are four major sections to the matrix: Material Hazards, Processing Hazards, Equipment Hazards, and Environmental Hazards. Various criteria within these categories determine the level of hazard analysis required.

These guidelines are the MINIMUM suggested methods, and are not meant to be a substitute for good judgment. Combinations of lower level hazards may indicate a need for a higher level of review. Conversely, if in your judgment you can use a lower level of hazard review than that indicated by these guidelines, you may do so with the approval of the Supervisor's Designee and Division Chief.

Level of Process Hazard Analysis

- 1. Low Hazard Review (LHR):** Low Hazard Review (LHR) is conducted when the hazard is deemed "low." Low hazard is defined as having little potential to create injury or property damage, and no potential for environmental release. A LHR requires completion of a brief description of the process, the potential hazards, and what steps will be taken to mitigate those hazards. A set of operating procedures, the personal protective equipment required, special training required, and the signature of those involved with the review shall be included. The Supervisor's Designee and users conduct this level of review. The review is performed using GSFC Form 23-56.
- 2. Moderate Hazard Review (MHR):** Moderate Hazard Review (MHR) is conducted when the hazards involved are deemed "moderate." Moderate hazard is defined as having the potential to cause injury, equipment damage, or environmental release. Supervisor's Designees and users conduct an MHR. The involvement of an OSH representative can be requested and is encouraged. A MHR requires the completion of a comprehensive checklist, and must be accompanied by a complete set of standard operating procedures. Among the information evaluated are process technology, potential hazards and mitigation, environmental issues, and adherence to specific engineering/design standards. The review is performed using GSFC Form 23-57.
- 3. High Hazard Review (HHR):** High Hazard Review (HHR) is conducted for experiments, equipment installations, or processes which are deemed "high hazard." High Hazard is defined as having the potential to cause serious injury, severe equipment or facility damage, or negative environmental impact.

A HHR Committee shall be established for each Laboratory that meets the criteria for High Hazard Review. The HHR Committee will consist of a chairperson, a representative from OSH Division, Medical and Environmental Division, researcher, technician, member of the Chemical Safety Committee (CSC), and any other resources deemed necessary. A comprehensive review by the HHR Committee of all potential hazards involved in processes and equipment is required. A member of the CSC or an OSH representative can help determine what type of HHR method will be used based on the nature of the hazard(s) presented. The HHR requires that a number of documents be assembled and made available to the review committee. Piping and instrument diagrams, chemical reaction characteristics, relevant incident reports, process chemistry, and operation procedures, as applicable, are all required.

The review is performed using GSFC Form 23-58 and shall be documented completely. The HHR Committee shall approve significant changes.

Required Participation for Process Hazard Analysis

Position	LHR	MHR	HHR
Supervisor's Designee and Users	X	X	X
Branch Head	X	X	X
OSH and MEMD Representative			X
Additional Technical Sources			X

Documentation Required

The Hazard Analysis Selection matrix, a copy of the most recent Hazard Review, and operating procedures/attachments shall be available in a prominent location in the laboratory while the work is going on or if the information is stored electronically at the location posted.

A dated copy of all safety documentation packages, including hazard reviews, Hazard Analysis Selection Matrices, and operating procedures, shall be sent to the OSH Division.

Hazard Analysis Selection Matrix

For new, modified or relocated processes, equipment or experiments, or scale-up of previous work, characterize your process according to the criteria below. Then use the most detailed analysis method called for by any single criterion.

Laboratory: Building _____ **Room** _____ **Responsible Org. Code:** _____

Laboratory Description:

	No Review Required	LHR	MHR	HHR
1. Material Hazard - Acute Toxicity				
HMIS Health Rating: Circle the Hazardous Material Identification System rating, found in the Material Safety Data Sheet (MSDS)	0	1-2	3	4
Cylinder DOT Label: if a cylinder, circle Yes if the DOT label on the cylinder indicates Poison Gas, Corrosive Gas, or Flammable Gas			Yes	
2. Material Hazard - Chronic Toxicity (Circle Yes if the MSDS indicates the material exhibits Chronic Toxicity)			Yes	
3. Material Hazard - Flammability (Choose applicable line and circle the HMIS rating from the MSDS)				
< 1 Liter & HMIS Flammability Rating	0-1	2-4		
> 1 Liter & HMIS Flammability Rating	0	1-2	3-4	
≥ 1 Liter and under Pressure or above Flash Point & HMIS Flammability Rating	0		1	2-4
4. Material Hazard - Reactivity (Circle one)				
HMIS Reactivity Rating from MSDS	0-1	2	3-4	
5. Processing Hazard - Radiation (Circle all that apply)				
Laser		Class I-IIIa	Class IIIB-IV	
X-Ray Source		<20kv	>20kv	
Radioisotopes in use	None		Yes	
UV, Infra-red, Microwave, Radio wave		<TLV	>TLV	
6. Processing Hazard - Pressure (Circle any one that applies)				
Non-glass	= 0 psig	< 0 psig or > 0 psig & <90psig	>90psig	
Glassware			< 0 or > 0 psig	
7. Processing Hazard - Chemical Reaction Energy				
Will adiabatic reaction lead to temperature change? Circle one that applies (Check MSDS)	< 60° F		> 60° F	
Will this cause solvent to boil? Circle Yes if applicable			Yes	
8. Processing Hazard - New Technology				
New chemistry of technology. Circle correct answer if applicable	None		Outside of Experience	Unknown Reactions
9. Equipment Hazard - Electrical (Circle one if applicable)	Protected < 120V	Exposed or > 120V		
10. Equipment Hazard - Mechanical (Circle Yes or No)				
Exposed pinch points, belts, chains, rotating parts, knives, suspended loads, stored energy, etc.	Yes	No		
11. Processing Hazard - Thermal				
Unprotected heated or chilled surfaces	> -20° F & < 140° F	< -20° F & > 140° F		
12. Environmental Hazards				
Noise (Circle one. Call x6-6669 if you need assistance)	< 80 dBA	> 80 dBA		
Hood Ventilation Testing (Circle one if applicable)		Exemption	Permit	

Contact the Occupational Safety and Health (OSH) Division, Code 350 for assistance in completing this matrix

Acronyms

DBA	decibels, A-scale	HMIS	Hazardous Material Identification System	TLV	Threshold Limit Value
DOT	Department of Transportation	OT	Odor Threshold		

Branch Head	Date	Supervisor's Designee	Date
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